

# **xChargeIn**

**UDP Programmers Guide V 2.01**



*Powering Business Worldwide*

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# 1 Introduction

This programmers guide provides the information required to develop an application for sending UDP commands to xChargeIn charging station. UDP commands can be used to get status information from the charging station or to control the charging station with a UDP client (PC software or smartphone app).

Using UDP, the charging station can be integrated into a smart home, which allows for example, the current power consumption to be regulated in response to a photovoltaic system.

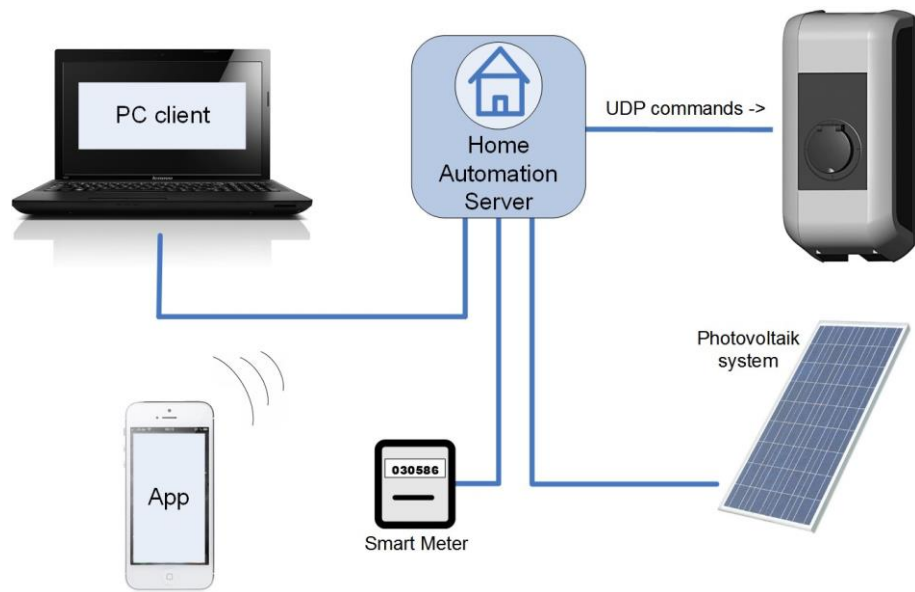


Fig. 1-1: Schematic overview (example)

## 1.1 Safety instructions

This document is an extension to the supplied manuals of xChargeIn.

**You must comply with all instructions and safety instructions in the supplied manuals!**

## 1.1.1 Representation of safety instructions

At various points in this manual, you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:



### **DANGER!**

indicates an imminently hazardous situation, which will result in death or serious bodily injury if the corresponding precautions are not taken.

---

---



### **WARNING!**

indicates a potentially hazardous situation, which can result in death or serious bodily injury if the corresponding precautions are not taken.

---

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### **CAUTION!**

means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in slight bodily injury.

---

---

### **Caution**

means that damage to property can occur if the corresponding safety measures are not taken.

---

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### **ESD**

This symbol reminds you of the possible consequences of touching electrostatically sensitive components.

---

### ***Information***

*Identifies practical tips and useful information. No information that warns about potentially dangerous or harmful functions is contained.*

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## 1.2 Verification of validity

The user of this document is obligated to obtain information with regard to the validity of this document.

## 1.3 Target group

This document contains information for people with the relevant technical knowledge and programming skills in the applicable area and appropriate to the operations they are required to perform.

### 1.4 Requirements

The following requirements have to be met in order to use the UDP functionality:

- **EATON xChargeIn S-series or M-series** with firmware version **3.9.14** or higher
- The UDP interface is enabled by switching the DIP switch DSW1.3 to "ON" (for details regarding the DIP switches, see the "installation manual").
- A PC or smartphone for sending the UDP commands. This also requires a suitable UDP client software or UDP app.
- The charging station has to be connected (via LAN cable or WLAN) to the same network as the application.

#### **Information**

*The latest manuals and firmware can be downloaded here: [www.eaton.com/evc](http://www.eaton.com/evc)*

### 1.5 Further documentation and software

Manuals, further information and software downloads are available on the EATON website:

[www.eaton.com/evc](http://www.eaton.com/evc)

## 2 UDP interface: Guidelines

The following section contains rules and guidelines to ensure the best usability.

### 2.1 Required command delays

The following time intervals are the minimum required waiting times between UDP commands in general and the scheduled repetition of the same command. Any application communicating with xChargeIn is required to comply with these waiting times.

The minimum waiting time between any two UDP commands is defined as follows:

- $t\_UDP\_pause = 100\text{ ms}$

The minimum waiting time between the scheduled repetitions of any UDP command is defined as follows:

- $t\_COM\_pause = 5\text{ s}$

The minimum waiting time after sending a disable command (e.g. `ena 0`) is defined as follows:

- $t\_DIS\_pause = 2\text{ s}$

### 2.2 Addressing and communication port

Always use direct addressing for communication. This means that each command or UDP session has to contain the IP address of the specific charging station.

The port used for UDP communication is 7090. Ensure that this port is not blocked by a firewall or other ongoing communication.

#### **Information**

*Do not communicate with a charging station without addressing it by its IP address. Even if it seems to work fine in some cases, this practice is dangerous for multiple stations in the same network. This feature will be discontinued.*

### 2.3 Recommended communication buildup scheme

The following scheme illustrates a recommended process for the detection and the initial communication buildup:

- 1) Send "i" to network address/port 7090
- 2) Wait for t\_UDP\_pause

If a device sends a response, continue with step 3 otherwise return to step 1.

- 3) Send "report 1" to IP address of charging station/port 7090
- 4) Wait for t\_UDP\_pause
- 5) Send "report 2" to IP address of charging station/port 7090
- 6) Wait for t\_UDP\_pause
- 7) Send "report 3" to IP address of charging station/port 7090
- 8) Wait for t\_UDP\_pause

Now the complete device data and all acquirable information is available to the application.

### 2.4 RFID authorization

The following section provides information regarding the RFID authorization function as well as a method to detect if this function is enabled.

All variants of the xChargeIn charging stations save the RFID tags in a whitelist, which can be deleted by performing a special reset or extended by using the master RFID card. For more information please refer to the "operating instructions".

#### 2.4.1 xChargeIn S-series

xChargeIn S-series has no dedicated setting to enable/disable the RFID authorization. A charging station with an empty whitelist is permanently unlocked and a charging station with at least one entry in the whitelist is locked. The data shown in the following table can be acquired using the command `report 2`.

Whitelist	Operating status	State	Plug	AuthON	Authreq
Empty	idle	1	3	0	0
Empty	plugged but not charging	2	7	0	0
Empty	charging	3	7	0	0
Not empty	idle and locked	1	3	1	1
Not empty	unlocked and not charging	1	3	1	0
Not empty	unlocked and plugged but not charging	2	7	1	0
Not empty	unlocked and charging	3	7	1	0

The following can be concluded for all device types listed as xChargeIn S-series: If the field “AuthON” is set to “0”, then the authorization function is disabled.

## 2.4.2 xChargeIn M-series

xChargeIn M-series features a web interface with a dedicated setting for the authorization function. This function is governed by an additional circuit board called “COM-module” which also houses the WiFi components. The RFID authorization can be deactivated even though the whitelist of the charging station is not empty.

xChargeIn M-series will behave like xChargeIn S-series after a restart until the COM-module is ready (~ 5 min after restart). The data shown in the following table can be acquired using the command `report 2`.

Whitelist	Operating status	State	Plug	AuthON	Authreq
Empty	idle	1	3	0	0
Empty	plugged but not charging	2	7	0	0
Empty	charging	3	7	0	0
Empty	idle and locked (cannot be unlocked since whitelist is empty)	1	3	1	1
Not empty	idle	1	3	0	0
Not empty	plugged but not charging	2	7	0	0
Not empty	charging	3	7	0	0
Not empty	idle and locked	1	3	1	1
Not empty	unlocked and not plugged	1	3	1	0
Not empty	unlocked and plugged but not charging	2	7	1	0
Not empty	unlocked and charging	3	7	1	0

The following can be concluded for all device types listed as xChargeIn M-series: If the field “AuthON” is set to “0”, then the authorization function is disabled.



## 2.5 Current control

Please note that AC (alternating current) charging stations do not control/change the charging current directly. AC charging stations use a PWM (pulse width modulation) signal to communicate the maximum allowed charging current to the vehicle as specified in IEC 61851-1. All xChargeIn are AC charging stations. The actual current is solely controlled by the vehicle. If the wording used in this document indicates a current change, the actual meaning is always a change in the maximum allowable current (target current) communicated to the vehicle.

xChargeIn complies with IEC 61851-1. This international standard requires a minimum waiting time between two consecutive current changes. To fulfill this requirement, all xChargeIn will delay the execution of UDP commands requesting a current change during a charging session. The affected commands are `currtime` and `curr`. The request to stop charging via `currtime 0 1` will not be delayed and executed as soon as possible.

When a command, either `currtime` or `curr`, sets a new value for “Curr user” the device prepares to change the target current within the next 6-7 seconds. If another current change is requested via UDP command during this period of time the target current will be overwritten but the timer will not reset. The following examples illustrate the system behavior:

### Example 1

```
TCH-> curr 16000
0170 : 30.05.2017 10:07:19 : 192.168.2.100 : TCH-OK :done
TCH-> 0171 : 30.05.2017 10:07:25 : 192.168.2.100 : <"Max curr": 16000>
```

10:07:19 `curr` command changes the value of “Curr user” immediately.

10:07:19 Internal timer starts at the same moment.

10:07:25 The change in the target current is executed and the value of “Max curr” is changed.

### Example 2

```
TCH-> currtime 18000 1
0083 : 30.05.2017 09:46:09 : 192.168.2.100 : TCH-OK :done
TCH-> currtime 24000 1
0084 : 30.05.2017 09:46:11 : 192.168.2.100 : TCH-OK :done
TCH-> 0085 : 30.05.2017 09:46:16 : 192.168.2.100 : <"Max curr": 24000>
```

09:46:09 The first `currtime` command initiates a change of the target current.

09:46:10 The field “Curr user” is updated and the internal timer starts.

09:46:11 The second `currtime` requests another current adaptation.

09:46:12 The field “Curr user” is updated again but the internal timer is already running.

09:46:16 The change in the target current is executed and the value of “Max curr” is changed to the value sent by the last command.

### 3 UDP commands

#### 3.1 General information

**Information**

*When using UDP commands it is strongly recommended to protect your network to prevent unauthorized control.*

The following section will cover all available UDP commands and categorize them appropriately into commands meant for regular use and commands with specific use cases.

The charging station reacts on broadcasts and directly addressed commands. In a group of several charging stations, direct addressing must be used because otherwise all charging stations would react.

The commands are sent to the charging station as simple text commands (without end characters such as <CR> or <LF>). The replies come as data packages with up to 512 bytes and are formatted in JSON standard.

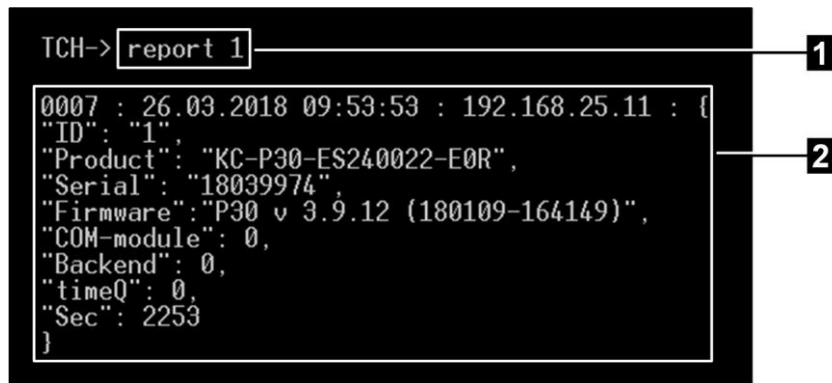


Fig. 3-2: Example of a UDP command and the reply from the charging station



**Information**

*UDP does not support error correction functionality. Please verify the effect of the sent commands yourself.*

Port information:

- Send port = UDP 7090
- Receive port = UDP 7090

### 3.2 UDP commands intended for regular use

The following section contains all UDP commands meant for regular use. These commands are used to gain information about the current state of the device as well as to control the next or the current charging session. All settings caused by these commands are not permanent and are reset at the next time the device registers that the EV plug is pulled from a vehicle inlet or the charging station is restarted.

#### 3.2.1 UDP command: i

This command will deliver basic information about the addressed charging station. Each communication buildup should be done by using “i”.

**Command structure**

Command	Parameters	Additional Description
i	-	-

**Reply structure**

Field	Contents	Additional Description
Firmware	String (32 chars)	Firmware version of the device

#### 3.2.2 UDP command: report 1

If the IP address in the network is known, the use of `report 1` as a unicast is recommended. It delivers more information as `i`, but is not designed to be used as a broadcast to search for xChargeIn charging stations in the network.

**Command structure**

Command	Parameters	Additional Description
report 1	-	-

**Reply structure**

Field	Contents	Additional Description
ID	1	ID of the report
Product	String (32 chars)	Product name as defined by the manufacturer
Serial	String (8 chars)	Serial number of the device
Firmware	String (32 chars)	Firmware version of the device
COM-module	0	No communication module is present.
	1	Communication module is present.

Field	Contents	Additional Description
Backend	0	No backend communication is present.
	1	Backend communication is present.
timeQ	0	Not synced time (for more information see "setdatetime").
	X	Strong synced time (for more information see "setdatetime").
	2	Weak synced time (for more information see "setdatetime").
Sec	uint32	Current state of the system clock in seconds from the last startup of the device.

### 3.2.3 UDP command: report 2

#### Command structure

Command	Parameters	Additional Description
report 2	-	-

#### Reply structure

Field	Contents	Additional Description
ID	2	ID of the report
State	0	Startup
	1	Not ready for charging Charging station is not connected to a vehicle, is locked by the authorization function or another mechanism.
	2	Ready for charging and waiting for reaction from vehicle.
	3	Charging
	4	Error is present
	5	Charging process temporarily interrupted because temperature is too high or any other voter denies.
Error1	uint16	Decimal number defining the error
Error2	uint16	Decimal number defining the error

Field	Contents	Additional Description
Plug	0	No cable is plugged.
	1	Cable is plugged into charging station.
	3	Cable is plugged into charging station and locked. This is the default idle state for all devices with permanently attached cable.
	5	Cable is plugged into charging station and vehicle but not locked.
	7	Cable is plugged into charging station and vehicle, furthermore the cable is locked. Charging is not possible until plug state "7" is reached.
AuthON	0	Authorization function is deactivated.
	1	Authorization function is activated.
Authreq	0	Authorization via RFID card is not required. OR The authorization via RFID card was already performed.
	1	Authorization via RFID card is required.
Enable sys	0	Charging state cannot be enabled.
	1	Charging state can be enabled.
Enable user	0	Device is disabled (e.g. via "ena 0").
	1	Device is enabled.
Max curr	uint16 Possible values: 0; 6000 - 32000	Current value in mA offered to the vehicle via control pilot signalization. (Signal type: PWM)
Max curr %	uint16 Possible values: 100 - 533; 1000	Duty cycle of the control pilot signal. The unit displayed is not % but 0.1%, which means that the value "1000" stands for a duty cycle of 100%. For more information concerning the control pilot refer to IEC 61851-1.
Curr HW	uint16 Possible values: 0; 6000 - 32000	Maximum current value in mA that can be supported by the hardware of the device. This value represents the minimum of the DIP switch settings, cable coding and temperature monitoring function.
Curr user	uint16 Possible values: 0; 6000 - 63000	Current setting in mA defined via UDP current commands. (Default: 63000 mA)
Curr FS	uint16 Possible values: 0; 6000 - 63000	Current setting in mA defined via <i>fail-safe</i> function.
Tmo FS	uint16 Possible values: 0; 10 - 600	Communication timeout in seconds before triggering the Failsafe function.
Curr timer	uint16 Possible values: 0; 6000 - 63000	Current value in mA that will replace the setting in the "Curr user" field as soon as "Tmo CT" expires.

Field	Contents	Additional Description
Tmo CT	uint32 Possible values: 0; 1 - 860400	Timeout in seconds before the current setting defined by the last <code>currrtime</code> command will be applied.
Setenergy	uint32 Possible values: 0; 1 - 999999999	Energy value in 0.1 Wh defined by the last <code>setenergy</code> command ( <code>setenergy 100000</code> specifies 10 kWh). Max. value is 99999999.9 Wh (higher values will cause a counter overflow).
Output	uint32 Possible values: 0; 1; 10 - 150	Show the setting of the UDP command <code>output</code> .
Input	0; 1	State of the input X1; For further information concerning the input X1, see the "installation manual".
Serial	String (8 chars)	Serial number of the device.
Sec	uint32	Current state of the system clock in seconds from the last startup of the device.

### 3.2.4 UDP command: report 3

#### Command structure

Command	Parameters	Additional Description
<code>report 3</code>	-	-

#### Reply structure

Field	Contents	Additional Description
ID	3	ID of the report
U1	int (3 digits)	Measured voltage value on phase 1 in V
U2	int (3 digits)	Measured voltage value on phase 2 in V
U3	int (3 digits)	Measured voltage value on phase 3 in V
I1	int (5 digits)	Measured current value on phase 1 in mA
I2	int (5 digits)	Measured current value on phase 2 in mA
I3	int (5 digits)	Measured current value on phase 3 in mA
P	uint32 (8 digits)	Power in mW (effective power).
PF	int (4 digits) Possible values: 0 - 1000	Current power factor (cosphi). The unit displayed is not % but 0.1%.
E pres	uint32 Possible values: 0 - 999999999	Energy transferred in the current charging session in 0.1 Wh. This value is reset at the beginning of a new charging session. Max. value is 99999999.9 Wh (higher values will cause a counter overflow).

Field	Contents	Additional Description
E total	uint32 Possible values: 0 - 999999999	Total energy consumption (persistent, device related) in 0.1 Wh. Max. value is 99999999.9 Wh (higher values will cause a counter overflow).
Serial	String (8 chars)	Serial number of the device
Sec	uint32	Current state of the system clock in seconds from the last startup of the device.

**Example**

<ul style="list-style-type: none"> <li>Charging station is not connected to a vehicle.</li> </ul> <pre>TCH-&gt; report 3 0053 : 26.03.2018 10:45:35 : 192.168.25.11 : {   "ID": "3",   "U1": 0,   "U2": 0,   "U3": 0,   "I1": 0,   "I2": 0,   "I3": 0,   "P": 0,   "PF": 0,   "E pres": 0,   "E total": 0,   "Serial": "18039974",   "Sec": 1255 }</pre>	<ul style="list-style-type: none"> <li>Vehicle is charging.</li> </ul> <pre>TCH-&gt; report 3 0069 : 26.03.2018 10:50:21 : 192.168.25.11 : {   "ID": "3",   "U1": 228,   "U2": 2,   "U3": 2,   "I1": 10,   "I2": 0,   "I3": 0,   "P": 526,   "PF": 218,   "E pres": 0,   "E total": 0,   "Serial": "18039974",   "Sec": 1541 }</pre>
--	--

**3.2.5 UDP command: report 1xx (historical log entries)**

With the commands `report 101` up to `report 130` you can read the history of the last 30 charging sessions. `report 100` shows the latest charging session. After a reboot, the report will deliver all zero values. If a new session is started by plugging in the vehicle, a new Session ID is created in `report 100` and all the available values (start time, start energy value, RFID token code) are filled. If the session ends, the end values (end time and end reason) will also be added, and `report 100` is shifted to `report 101`.

**Command structure**

Command	Parameters	Additional Description
<code>report 100</code>	-	-

**Reply structure**

Field	Contents	Additional Description
ID	100	ID of the report
Session ID	uint32	ID of the current charging session. This value will be assigned automatically and is not resettable. This value is incremented session by session. Due to the high maximum value (over 4 billion possible IDs), the session ID can be considered unique.

Field	Contents	Additional Description
Curr HW	uint16 Possible values: 0; 6000 - 32000	Maximum current value in mA that can be supported by the hardware of the device. This value represents the minimum of the DIP switch settings, cable coding and temperature monitoring function.
E start	uint32 Possible values: 0 - 999999999	Total energy consumption (persistent, device related) without the current charging session in 0.1 Wh at the beginning of the charging session. Max. value is 99999999.9 Wh (higher values will cause a counter overflow).
E pres	uint32 Possible values: 0 - 999999999	Energy transferred in the current charging session in 0.1 Wh. This value is reset at the beginning of a new charging session. Max. value is 99999999.9 Wh (higher values will cause a counter overflow).
started[s]	uint32	State of the system clock in seconds from the last startup of the device at the start of the charging session.
ended[s]	uint32	State of the system clock in seconds from the last startup of the device at the end of the charging session.
started	YYYY-MM-DD hh:mm:ss.000 string (23 chars)	If the device cannot access an NTP time server, this field will contain the same data as "started[s]" or set with "setdatetime".
ended	YYYY-MM-DD hh:mm:ss.000 string (23 chars)	If the device cannot access an NTP time server, this field will contain the same data as "ended[s]". If the device can access the internet, it will try to reach an NTP time server. This date stamp will represent the current time in UTC at the end of the charging session.
reason	0	Charging session has not ended.
	1	Charging session was terminated by unplugging.
	10	Charging session was terminated via de-authorization with the RFID card used for starting the session.
timeQ	0	Not synced time (for more information see "setdatetime").
	X	Strong synced time (for more information see "setdatetime").
	2	Weak synced time (for more information see "setdatetime").
RFID tag	000000000000... String (20 chars)	RFID Token ID if session started with RFID. First character is the lowest nibble.
RFID class	000000000000... String (20 chars)	If all digits are "0", then no RFID card was used to start the charging session (authorization is set to "OFF").
Serial	String (8 chars)	Serial number of the device
Sec	uint32	Current state of the system clock in seconds from the last startup of the device



Example

- Vehicle is charging.
- report 100 and report 101 will contain the same information until a new session is started.

```
TCH-> report 100
0159 : 26.03.2018 13:31:08 : 192.168.25.11 : {
  "ID": "100",
  "Session ID": 13,
  "Curr HW": 10000,
  "E start": 0,
  "E pres": 0,
  "started[sl]": 2107,
  "ended[sl]": 2334,
  "started": "2107000",
  "ended": "2334000",
  "reason": 1,
  "time0": 0,
  "RFID tag": "0000000000000000",
  "RFID class": "00000000000000000000",
  "Serial": "18039974",
  "Sec": 2915
}
```

```
TCH-> report 101
0160 : 26.03.2018 13:32:37 : 192.168.25.11 : {
  "ID": "101",
  "Session ID": 13,
  "Curr HW": 10000,
  "E start": 0,
  "E pres": 0,
  "started[sl]": 2107,
  "ended[sl]": 2334,
  "started": "2107000",
  "ended": "2334000",
  "reason": 1,
  "time0": 0,
  "RFID tag": "0000000000000000",
  "RFID class": "00000000000000000000",
  "Serial": "18039974",
  "Sec": 3003
}
```

3.2.6 UDP command: currtime

The command `currtime` can be used to control the charging current at any time. The setting will be active after the delay specified by the “t” parameter (e.g. the command `currtime 12000 20` will change the field “Curr user” to 12 A after 20 s). All changes caused by `currtime` are not permanent and will be reset at the next time the charging station registers that the vehicle plug is pulled from a vehicle inlet or the charging station. The changes can be displayed with the command `report 2`.

- `currtime 0 1`: This command issues a charging stop similar to `ena 0`. The charging station will display a blue main LED bar. Charging will be refused until the setting is overwritten by a new `currtime` command or one of the aforementioned reset conditions is met. The execution of this command will take approximately 1 second. If `currtime 0 1` is used, then no other command should be sent for 2 seconds to ensure an undisturbed execution of the disable command.
- `currtime 0 0`: This command nullifies a previously issued `currtime` as long as the timer is still running

Command structure

Command	Parameters	Additional Description
currtime [c] [t]	[c]: Current setting	Current value in mA. Possible values: 0; 6000 - 63000
	[t]: Time delay	Timeout in seconds before the current will be applied. Possible values: 0; 1 - 860400 Values higher than 860400 will be discarded.

Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

Example 1

- Vehicle is charging.
- UDP command `currtime 7000 20` was sent (charging current should change to 7 A after 20 s).

```
TCH-> report 2
0242 : 26.03.2018 14:47:43 : 192.168.25.11 : {
  "ID": "2",
  "State": 3,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 1,
  "Enable user": 1,
  "Max curr": 10000,
  "Max curr %": 166,
  "Curr HW": 10000,
  "Curr user": 63000,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 7000,
  "Tmo CT": 17,
  "Setenergy": 0,
  "Output": 0,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 7510
}
```

Previous UDP current setting

Delayed currtime change

Time left until currtime is activated

- After 20 seconds the current is changed.

```
TCH-> 26.03.2018 14:48:06 : 192.168.25.11 : {"Max curr": 7000}
TCH-> report 2
0245 : 26.03.2018 14:48:16 : 192.168.25.11 : {
  "ID": "2",
  "State": 3,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 1,
  "Enable user": 1,
  "Max curr": 7000,
  "Max curr %": 116,
  "Curr HW": 10000,
  "Curr user": 7000,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 7000,
  "Tmo CT": 0,
  "Setenergy": 0,
  "Output": 0,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 7543
}
```

"Curr user" is set to "Curr timer"

Example 2

- Cable is plugged into charging station and vehicle, furthermore the cable is locked.
- Charging is not allowed due to UDP command `ena 0`.
- UDP command `currtime 7500 15` was sent to start the charging session.

```
TCH-> report 2
0273 : 26.03.2018 15:20:29 : 192.168.25.11 : {
  "ID": "2",
  "State": 1,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 0,
  "Enable user": 0,
  "Max curr": 0,
  "Max curr %": 1000,
  "Curr HW": 10000,
  "Curr user": 63000,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 7500,
  "Tmo CT": 11,
  "Setenergy": 0,
  "Output": 0,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 9475
}
```

Charging is disabled due to UDP command `ena 0`

Delayed `currtime` change

Time left until `currtime` is activated

```
TCH-> report 2
0278 : 26.03.2018 15:21:00 : 192.168.25.11 : {
  "ID": "2",
  "State": 3,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 1,
  "Enable user": 1,
  "Max curr": 7500,
  "Max curr %": 125,
  "Curr HW": 10000,
  "Curr user": 7500,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 7500,
  "Tmo CT": 0,
  "Setenergy": 0,
  "Output": 0,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 9507
}
```

Charging is enabled due to UDP command `currtime`

Charging current

### 3.2.7 UDP command: setenergy

The command `setenergy` can be used to set an energy limit for an already running or the next charging session. If the energy limit is greater than or equal to the value in the `E pres` field of `report 3` the charging session will be stopped and the device will be deactivated (similar to `ena 0`). All settings caused by `setenergy` are not permanent and are reset at the next time the device registers that the EV plug is pulled from a vehicle inlet or the charging station is restarted. The `setenergy` command must only be used during a charging session. The reference value (`E pres` from `report 3`) is reset at the beginning of a new charging session and not at the end of the charging session. This can lead to an unexpected disabling of the charging station if the value defined by `setenergy` is smaller than the energy transferred during the last charging session.

One variant of the `setenergy` command must be highlighted:

- `setenergy 0`: A previously set energy limit is deactivated

#### Command structure

Command	Parameters	Additional Description
<code>setenergy [e]</code>	<code>[e]</code> : Energy value	Energy value in 0.1 Wh, e. g. <code>setenergy 100000</code> specifies 10 kWh. Possible values: 0; 1 - 999999999 Max. value is 99999999.9 Wh (higher values will cause a counter overflow)

#### Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

### 3.2.8 UDP command: output

Output opens and closes the relay terminal X2. X2 is located in the connection panel of the charging station. The reply `TCH-OK` confirms only the receiving of the command and not the correctness of the value. Values between 2 and 9 are not being replied to (reserved functions). Invalid values (e.g. letters) are leading to a deactivation of the relay. The correct reception can be verified using `report 2`.

#### **Information**

*This command needs DSW1.2 to be set to ON.*

## Command structure

Command	Parameters	Additional Description
output [n]	0	Close
	1	Open
	>= 10	Pulse output with the specified number of pulses (pulses / kWh) and is stored in the EEPROM; reasonably usable up to 150.

## Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

### 3.2.9 UDP command: start

The command `start` can be used to authorize a charging session if the authorization function is activated. The effect is the same as holding an RFID card in front of the RFID reader. The command needs a valid RFID tag from the whitelist of the charging station. The token (tag) and the classifier are hexadecimal strings as in `report 100`.

## Command structure

Command	Parameters	Additional Description
Start[id] [class]	[id]: RFID tag	8 byte hex string, identifier of RFID card
	[class]: RFID class	10 byte hex string, classifier of RFID card

## Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

**Example**

- Authorization is set to "ON"
- Charging station and vehicle are ready to start the charging session

```
TCH-> start f287506300000000 000000000000000000
0143 : 27.03.2018 11:19:43 : 192.168.25.11 : [{"Max CURF": 10000}]
TCH-> 0144 : 27.03.2018 11:19:43 : 192.168.25.11 : [{"State": 2}]
0145 : 27.03.2018 11:19:43 : 192.168.25.11 : [{"State": 2}]
0146 : 27.03.2018 11:19:43 : 192.168.25.11 : [{"State": 2}]
0147 : 27.03.2018 11:19:47 : 192.168.25.11 : [{"State": 2}]
0148 : 27.03.2018 11:19:48 : 192.168.25.11 : [{"State": 3}]

TCH-> report 3
0149 : 27.03.2018 11:19:55 : 192.168.25.11 : {
  "ID": "3",
  "U1": 227,
  "U2": 2,
  "U3": 2,
  "I1": 10,
  "I2": 0,
  "I3": 1,
  "P": 353,
  "PF": 153,
  "E pres": 0,
  "E total": 0,
  "Serial": "18039974",
  "Sec": 6092
}
```

RFID tag and class of the RFID card which is listed in the whitelist of the charging station

Charging is in progress

```
TCH-> report 3
0161 : 27.03.2018 11:20:59 : 192.168.25.11 : {
  "ID": "3",
  "U1": 0,
  "U2": 0,
  "U3": 0,
  "I1": 0,
  "I2": 0,
  "I3": 0,
  "P": 0,
  "PF": 0,
  "E pres": 0,
  "E total": 0,
  "Serial": "18039974",
  "Sec": 6155
}
```

Charging was stopped by holding the RFID card, with the same tag and class, in front of the RFID reader of the charging station

**3.2.10 UDP command: stop**

The command `stop` can be used to deauthorize a charging session if the authorization function is activated. The effect is the same as holding an RFID card in front of the RFID reader during a running charging session. The deauthorization will only work correctly if the RFID tag used is the same as the one used to start the charging session.

**Command structure**

Command	Parameters	Additional Description
<code>stop [id]</code>	[id]: RFID tag	8 byte hex string, identifier of RFID card

## Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

## Example

- Authorization is set to "ON"
- Charging station and vehicle are ready to start the charging session
- RFID card has been held in front of the RFID reader and the charging session has started

```
TCH-> report 100
0116 : 27.03.2018 10:32:11 : 192.168.25.11 : {
  "ID": "100",
  "Session ID": 27,
  "Curr HW": 10000,
  "E start": 0,
  "E pres": 0,
  "started[ls]": 3134,
  "ended[ls]": 0,
  "started": "3134000",
  "ended": "0",
  "reason": 0,
  "timeQ": 0,
  "RFID tag": "f287506300000000",
  "RFID class": "00000000000000000000",
  "Serial": "18039974",
  "Sec": 3227
}
```

RFID tag of the current charging session

- The charging session is stopped using the UDP-command stop and the RFID tag.

```
TCH-> stop f287506300000000
0130 : 27.03.2018 10:45:49 : 192.168.25.11 : TCH-OK :done

TCH-> 0131 : 27.03.2018 10:45:50 : 192.168.25.11 : [{"Enable sys": 0}]
0132 : 27.03.2018 10:45:50 : 192.168.25.11 : [{"State": 5}]
0133 : 27.03.2018 10:45:50 : 192.168.25.11 : [{"Max curr": 0}]

TCH-> report 3
0134 : 27.03.2018 10:45:54 : 192.168.25.11 : {
  "ID": "3",
  "U1": 0,
  "U2": 0,
  "U3": 0,
  "I1": 0,
  "I2": 0,
  "I3": 0,
  "P": 0,
  "PF": 0,
  "E pres": 0,
  "E total": 0,
  "Serial": "18039974",
  "Sec": 4051
}
```

RFID tag

Charging is stopped

3.2.11 UDP command: **setdatetime**

The charging station tries to set its date and time via an NTP time server. If the device cannot access an NTP time server the “started” time in `report 100` will contain the same information as “started [s]”. A reason for not setting the time stamp via NTP time sever could be that the charging station has no internet connection.

If xChargeIn M-series is used, the time stamp will be provided by the XPU. With the UDP command `setdatetime` it is possible to set a date and a time for the charging station. Depending on how and when the time stamp was set, it can be distinguished between how trustworthy the time stamp is.

Strong synced time:

- time was synced within 4320 minutes (3 days) via NTP
- time was synced within 4320 minutes (3 days) via OCPP
- time was synced within 4320 minutes (3 days) via

PROXY Weak synced time

- time was synced via web interface
- time was synced via UDP
- time was not synced within 4320 minutes (3 days) via NTP
- time was not synced within 4320 minutes (3 days) via OCPP
- time was not synced within 4320 minutes (3 days) via

PROXY Not synced time

- time was set via start of the system on the build time

The time quality (“timeQ”) can be found in `report 1` and `report 1xx`.

**Command structure**

Command	Parameters	Additional Description
<code>setdatetime [s]</code>	[s]: seconds	Unix epoch time (e.g. 1497944434)

**Reply structure**

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

**Example**

- Vehicle is charging.

```

TCH-> setdatetime 1522405176
0008 : 30.03.2018 12:19:46 : 192.168.25.11 : TCH-OK :done
                    
```

Time stamp is set



<pre>TCH-&gt; report 1 0010 : 30.03.2018 12:19:56 : 192.168.25.11 : {   "ID": "1",   "Product": "KC-P30-ES240022-E0R",   "Serial": "18039974",   "Firmware": "P30 v 3.9.12 (180109-164149)",   "COM-module": 0,   "Backend": 0,   "timeQ": 2,   "Sec": 227 }</pre>	<p>Weak synced time: Time stamp was set via UDP</p>
<pre>TCH-&gt; report 100 0017 : 30.03.2018 12:22:05 : 192.168.25.11 : {   "ID": "100",   "Session ID": 49,   "Curr HW": 10000,   "E start": 59,   "E pres": 0,   "started[sl]": 1522405196,   "ended[sl]": 0,   "started": "2018-03-30 10:19:56.000",   "ended": "0",   "reason": 0,   "timeQ": 0,   "RFID tag": "0000000000000000",   "RFID class": "00000000000000000000",   "Serial": "18039974",   "Sec": 356 }</pre>	<p>"started" is set according to the UDP command</p>
<pre>TCH-&gt; report 101 0024 : 30.03.2018 12:22:55 : 192.168.25.11 : {   "ID": "101",   "Session ID": 49,   "Curr HW": 10000,   "E start": 59,   "E pres": 0,   "started[sl]": 1522405196,   "ended[sl]": 1522405355,   "started": "2018-03-30 10:19:56.000",   "ended": "2018-03-30 10:22:35.000",   "reason": 1,   "timeQ": 2,   "RFID tag": "0000000000000000",   "RFID class": "00000000000000000000",   "Serial": "18039974",   "Sec": 406 }</pre>	<p>Duration of the charging session</p>

3.2.12 UDP command: display

Command structure


Command	Parameters	Additional Description
display [a] [min] [max] [tk] [text]	[a]	Determines whether default or non-default values are used for the duration [text] is displayed. 0 = default (min duration = 2 sec, max duration = 10 sec, fixed token); 1 = min and max duration can be defined.
	[min]	Defines the duration in seconds how long the text is displayed before another display command will be processed (internal MID metering relevant information may overrule this).
	[max]	Defines the duration in seconds how long the text is displayed if no additional display command follows.
	[tk]	Token – for internal use only.
	[text]	Text shown on the display. A maximum of 23 ASCII characters can be used. Note: \$ will be replaced by a blank space. ~ will be replaced by a Σ

Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

Example

```
TCH-> display 0 0 0 0 EATON
0200 : 27.03.2018 13:09:54 : 192.168.25.11 : TCH-OK :done
```



3.2.13 UDP command: unlock

The command `unlock` unlocks the socket of the device. The charging process has to be stopped first (e.g. via `currtime 0 1` or `ena 0`)

Command structure

Command	Parameters	Additional Description
unlock	-	-

Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

### 3.3 UDP commands with permanent effects

The following UPD commands should not be used regularly, especially not with mobile applications, as they change the device`s behavior permanently until they are overwritten or the device gets rebooted.

#### 3.3.1 UDP command: ena

The `ena` command can be used to permanently disable the system by using the parameter `0`. After receiving `ena 0` the device will be disabled until it is rebooted or `ena 1` or `currtime` are used. The execution of `ena 0` will take approximately 1 second. If `ena 0` is used, then no other command should be sent for 2 seconds to ensure an undisturbed execution of the disable command.

Command structure

Command	Parameters	Additional Description
<code>ena [m]</code>	<code>[m]: modifier</code>	Modifier for the <code>ena</code> command Possible values: 0, 1; Other values may not be used.

Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

Example

- Authorization is set to "OFF"
- UDP command `ena 0` was sent before the vehicle was connected to the charging station.
- Charging station and vehicle are ready to start the charging session.

```
TCH-> ena 0
0009 : 27.03.2018 13:22:17 : 192.168.25.11 : TCH-OK :done
0010 : 27.03.2018 13:22:17 : 192.168.25.11 : {"Enable sys": 0}

TCH-> 0011 : 27.03.2018 13:22:22 : 192.168.25.11 : {"Plug": 1}
0012 : 27.03.2018 13:22:23 : 192.168.25.11 : {"Plug": 3}
0013 : 27.03.2018 13:22:25 : 192.168.25.11 : {"Plug": 7}

TCH-> report 2
0014 : 27.03.2018 13:22:33 : 192.168.25.11 : {
  "ID": "2",
  "State": 1,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 0,
  "Enable user": 0,
  "Max curr": 0,
  "Max curr %": 1000,
  "Curr HW": 10000,
  "Curr user": 63000,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 0,
  "Tmo CT": 0,
  "Setenergy": 0,
  "Output": 150,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 446
}
```

Charging session is not started due to UDP command ena 0

```
TCH-> 0015 : 27.03.2018 13:22:39 : 192.168.25.11 : {"Plug": 3}
0016 : 27.03.2018 13:22:40 : 192.168.25.11 : {"Plug": 1}
0017 : 27.03.2018 13:22:44 : 192.168.25.11 : {"Plug": 0}
0018 : 27.03.2018 13:22:48 : 192.168.25.11 : {"Plug": 1}
0019 : 27.03.2018 13:22:49 : 192.168.25.11 : {"Plug": 3}
0020 : 27.03.2018 13:22:53 : 192.168.25.11 : {"Plug": 7}

TCH-> report 2
0021 : 27.03.2018 13:23:00 : 192.168.25.11 : {
  "ID": "2",
  "State": 1,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 0,
  "Enable user": 0,
  "Max curr": 0,
  "Max curr %": 1000,
  "Curr HW": 10000,
  "Curr user": 63000,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 0,
  "Tmo CT": 0,
  "Setenergy": 0,
  "Output": 150,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 473
}
```

Unplugging the vehicle does not change the state "Enable sys: 0" in contrast to currtimer 0 1

### 3.3.2 UDP command: curr

The command `curr` can be used to control the target charging current at any time. This command directly changes the value in the "Curr user" field in `report 2`. All changes made by `curr` are permanent until the device is re-

booted. The only option to remove a `curr` setting without a restart is to overwrite it with a `currttime` command. When the `currttime` setting is copied from "Curr timer" to "Curr user" the value from a previous `curr` is overwritten and thus is resettable by unplugging (see section command: `currttime`). In general, it is not recommended to use the `curr` command, since the current can be easily controlled via the non-permanent `currttime`. If the charging current of the charging station needs to be lowered permanently, a reconfiguration of the DIP switch settings is recommended (see "installation manual").

### Command structure

Command	Parameters	Additional Description
<code>curr [c]</code>	[c]: Current setting	Current value in mA Possible values: 6000 - 63000

### Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

### Example

- Vehicle is charging.

```
TCH-> report 2
0041 : 28.03.2018 08:26:09 : 192.168.25.11 : {
  "ID": "2",
  "State": 3,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 1,
  "Enable user": 1,
  "Max curr": 10000,
  "Max curr %": 166,
  "Curr HW": 10000,
  "Curr user": 63000,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 0,
  "Tmo CT": 0,
  "Setenergy": 0,
  "Output": 150,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 691
}
```

Vehicle is charging with default values.

```

TCH-> curr 7500
0042 : 28.03.2018 08:26:17 : 192.168.25.11 : TCH-OK :done

TCH-> report 2
0043 : 28.03.2018 08:26:17 : 192.168.25.11 : {
  "ID": "2",
  "State": 3,
  "Error1": 0,
  "Error2": 0,
  "Plug": 7,
  "AuthON": 0,
  "Authreq": 0,
  "Enable sys": 1,
  "Enable user": 1,
  "Max curr": 10000,
  "Max curr %": 166,
  "Curr HW": 10000,
  "Curr user": 7500,
  "Curr FS": 0,
  "Tmo FS": 0,
  "Curr timer": 0,
  "Tmo CT": 0,
  "Setenergy": 0,
  "Output": 150,
  "Input": 0,
  "Serial": "18039974",
  "Sec": 705
}

TCH-> 0079 : 28.03.2018 08:35:32 : 192.168.25.11 : {"Plug": 0}
0080 : 28.03.2018 08:35:37 : 192.168.25.11 : {"Plug": 1}
0081 : 28.03.2018 08:35:38 : 192.168.25.11 : {"Plug": 3}
0082 : 28.03.2018 08:35:43 : 192.168.25.11 : {"Plug": 7}
0083 : 28.03.2018 08:35:43 : 192.168.25.11 : {"Max curr": 7500}
0084 : 28.03.2018 08:35:49 : 192.168.25.11 : {"State": 3}
    
```

### 3.3.3 UDP command: failsafe

The `failsafe` function is a way to detect a failure of the network communication between the UDP application and the charging station. In this case, the charging station will fall into a state with a definable current limitation. By default, the `failsafe` function is disabled and must be enabled by the application.

This function must be used with caution. It should be noted that all xChargeIn charging stations offer multiple ways to set up the device in such a way that electrical overload can be avoided. The hardware switches (DIP switches) allow to configure a limit for the maximum charging current that cannot be increased by UDP commands. The charging station also offers a monitoring function of the electrical connection of the household (in conjunction with an appropriate meter) preventing overload situations.

A triggered `failsafe` function can be recognized via the data offered by `report 2`: the "Enable sys" value is set to 0 and "Max curr" is equal to "Curr FS". After the `failsafe` function has been activated due to a timeout, you must set the values of current and the load enable again using the associated commands `currtimer / curr` and `ena`.

Command structure

Command	Parameters	Additional Description
failsafe [t] [c] [s]	[t]: Time delay	Timeout in seconds before the failsafe mode will be activated. The device must receive a <code>curr</code> , <code>currtime</code> or <code>ena</code> command to prevent the activation. Possible values: 0; 10 - 600 0: Disable failsafe mode
	[c]: Current setting	Maximum charging current in failsafe mode. Possible values: 0; 6000 - 63000 0: Disable charging in failsafe mode (similar to <code>ena 0</code> )
	[s]: Saved value	0: The failsafe function is active until the device is restarted. 1: The failsafe function is active and saves the settings into the EEPROM. The failsafe function will still be active after a reboot.

Reply structure

Field	Contents	Additional Description
-	TCH-OK: done	Generic confirmation message

### 3.4 UDP status messages

xChargeIn will send status messages to the source/IP address of the last UDP command it received. That means if there is only one application in the network sending commands to the charging station, the application will get the information about the most important state changes without the need to poll reports. xChargeIn will provide the information about the following state changes:

- “State” (see “report 2”)
- “Plug” (see “report 2”)
- “Input” (see “report 2”)
- “Enable sys” (see “report 2”)
- “Max curr” (see “report 2”)
- “E pres” (see “report 3”)

### 4 Disclaimer

Specifications are subject to change due to further technical developments. Details presented may be subject to correction.

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